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RECENT ADVANCES IN GEOGRAPHIC KNOWLEDGE  
ACCOMPLISHED BY THE UNITED STATES HYDROGRAPHIC OFFICE  
AT WASHINGTON.

BY

G. W. LITTLEHALES.

The efforts of the Hydrographic Office of the Navy Department in the field of geography must be primarily to help the navigator. Working as it does in the interests of the marine of the United States and of those classes of our citizens whose interests are promoted by every advance in the safety and celerity of navigation, the production of good navigational charts and the deduction of the best routes to be followed by steam and by sail have constituted the principal aim. In pursuing this aim the domains of the geography of the land, the geography of the sea, and the geography of the air have been entered.

The most recent of the expeditions sent out by the Hydrographic Office for the telegraphic determination of longitude returned to the United States in 1890, after having determined the longitudes of seven of the important secondary meridians of Mexico, Central America, the West Indies, and the north coast of South America. There have been directly determined by these various expeditions about forty secondary meridians, by which the longitudes of the principal maritime and geographical centres of the Western Hemisphere and of China and the East are accurately related to the established meridians of the United States and Europe. Many more positions depend upon these, so that they may be said to have made a large addition to our accurate knowledge of the earth's surface.

The vessels engaged in maritime surveying have, since 1885, extended the Pacific coast work of the Coast and Geodetic Survey, as far as it relates to the construction of nautical charts, from the boundary line between the United States and Mexico southward along the entire western coast of Lower California and northward along its eastern coast to La Paz—a distance of more than 1,000 miles.

The officers of the U. S. S. *Michigan* on the Great Lakes have surveyed the western part of Lake Erie, the Detroit River, and the harbors of Chicago, Cleveland and Erie, and furnished data for representing upon the charts many rocks and shoals, which the

increasing number of deep-draft vessels yearly discloses in these waters.

The officers of many of the United States vessels engaged in the general naval service have contributed surveys and geographical information relating to the places visited by them. In this way great improvements have recently been made in our charts of the harbors of Colon and Panama at the Atlantic and Pacific termini of the Panama Canal route, of Greytown and Brito at the Atlantic and Pacific termini of the Nicaragua Canal route, of the principal commercial ports of Honduras and Guatemala, of Honolulu and Pearl River in the Hawaiian Republic, and of other ports and special localities in various parts of the world.

In 1889 there was an important accession to our knowledge of the Arctic regions through the cruise of the U. S. S. *Thetis*, along the entire main coast line of Alaska from Port Tongass, in extreme southeastern Alaska, to Demarcation Point, in the Arctic Ocean. The cruise of this vessel was remarkable in several respects. By successful battling with the ice-pack, she was enabled to reach Mackenzie Bay, in British North America—the first Government vessel to carry the American flag in these waters. She also made the long stretch from Mackenzie Bay to Herald Island and Wrangel Land in one season, which was never before done.

Drawing upon the common stock of geographic knowledge and upon the geographic information which thus comes into the custody of the Navy Department, during the last decade, a set of general coast charts of the Western Hemisphere has been constructed; sets of special coast charts, harbor charts, and special charts have been completed to the extent of four-fifths; and the work has been extended into the Eastern Hemisphere where the general coast charts of China and Japan are practically complete, and where work is in progress in reference to the general coast charts of southern and eastern Africa.

The observations made in recent years to determine the magnetic declination, inclination, and intensity in connection with the surveys carried on under the authority of the Navy Department and in the navigation of the vessels of the Navy, have been discussed with a view of assigning the correct direction of the magnetic meridian on the charts, and also to throw light upon the causes and character of the secular variation of the magnetic needle. The publication of these observations and results forms an important contribution to the science of terrestrial magnetism.

Toward the increase of our knowledge of the geography of the

sea, besides a specially planned survey carried on in 1892 to determine a practicable route for laying a submarine telegraphic cable between California and the Hawaiian Islands, many deep-sea soundings and observations of density and temperature have been made by the naval service in the waters of all the great oceans. These observations have been of service in providing for the expanding system of submarine cables and also in the problems relating to ocean physics; for which latter purpose, especially in their bearing upon ocean currents, the reports of incoming navigators have been carefully collected and studied. Knowledge of the tides has been improved in relation to certain localities where data have been observed; and at Chemulpho, in Korea, and Magdalena Bay, in Mexico, series of observations of sufficient extent have been made to warrant their investigation by the harmonic analysis. The resulting tidal constants for these stations have been published for the benefit of those who are engaged in the prediction of tides.

From the information extracted from the log books of vessels voyaging in all parts of the world, monthly normal isobarometric and isothermal values have been deduced for some parts of the great oceans, notably the North Atlantic and North Pacific. The charts of these lines show the average distribution of the quantity of matter in the earth's atmosphere, which is identical with the distribution of barometric pressure, and depends solely upon the distribution of temperature over the surface of the globe. If the monthly average directions of the winds and currents, which have recently been much improved by our latest deductions, are also delineated upon such a chart, the direct relationship between pressure, wind, and current, now completely established by meteorologists, will be readily apparent. Besides these results in the climatology of the sea, the regular observations of mariners have provided for some progress in dynamic meteorology. Daily synoptic charts of the North Atlantic and North Pacific oceans, showing the prevailing weather and the progress of storms that cross those regions, have been prepared for several years past; and there are published each month pilot charts of the North Atlantic and North Pacific oceans, showing graphically the matters of value and interest to the maritime community, and particularly the directions and forces of the winds to be expected during the month succeeding the date of issue, the set of currents, the feeding grounds of marine animals, the regions of storm, fog and ice, the positions of derelicts and floating obstructions to navigation, and the best routes to be followed by steam and by sail.